

PATENT

Att. Dkt. No. AVAN/000331

REMARKS

This is intended as a full and complete response to the Office Action mailed May 6, 2004. Claims 1-18 were examined. The Examiner rejected claims 1-18 under 35 U.S.C. § 112, second paragraph, as being indefinite and vague, claims 1-18 under 35 U.S.C. § 103(a) as being obvious in view of Uenishi, Gordon or Karioja, claims 6-9 and 13-16 under 35 U.S.C. § 103(a) as being obvious in view of Karioja in combination with McCellan and claims 6-10 and 13-16 under 35 U.S.C. § 103(a) as being obvious in view of Karioja in combination with Uenishi. In response, Applicants have amended claims 1, 3-4 and 14-18.

Claim Rejections – 35 U.S.C. § 112

In Paragraph 3 of the Office Action, the Examiner rejected claims 1-18 under 35 U.S.C. § 112, second paragraph, as being indefinite, vague and confusing and for failing to particularly point out and distinctly claim the subject matter that Applicant regards as his invention. In particular, the Examiner explained that claim 1 recites a tunable edge emitting semiconductor laser without reciting any claim limitations to conform the claim to a semiconductor laser.

In response, Applicant has amended independent claim 1 to include limitations that more clearly delineate that the subject matter of Applicant's invention is, in fact, a type of semiconductor laser. Applicant therefore respectfully submits that amended claim 1 conforms with the requirements of 35 U.S.C. § 112, second paragraph, and requests withdrawal of the § 112 rejection of this claim. Since claims 2-18 depend from claim 1, Applicant respectfully requests withdrawal of the § 112 rejection of these claims as well.

Claim Rejections – 35 U.S.C. § 103(a)

In paragraph 4 of the Office Action, the Examiner rejected claims 1-18 under 35 U.S.C. § 103(a) as obvious in view of Japanese Patent No. 06-188497 to Uenishi, U.S. Patent No. 4,786,132 to Gordon or U.S. Patent No. 6,192,059 to Karioja. More particularly, the Examiner contends that the limitation recited in amended claim 1, "a total length of the active section and the tunable section is less than or equal to 20 μm ," does not constitute a nonobvious

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advancement over any of these cited references because "where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art." Applicant respectfully traverses.

As set forth in the specification, Applicant's invention solves a significant problem encountered with prior art tunable lasers, namely the problem of mode skipping over the laser's tuning range. This problem is especially troubling in dense optical communications system applications such as wavelength division multiplexing ("WDM"). See Application at p. 2, lines 7-18. In contrast to prior art tunable lasers, Applicant's tunable laser has a continuous tuning range of approximately 30 nm, meaning that Applicant's tunable laser does not exhibit mode skipping over this tuning range. See Application at p. 4, lines 2-6. As the specification makes clear, the limitation recited in amended claim 1, that the total length of the active section and the tunable section of the resonant cavity of the laser is less than or equal to 20 μ m, is central to generating this continuous tuning range, which is necessary for WDM optical systems. See Application, p. 8, line 18 – p. 9, line 4.

The Examiner states that Karioja discloses a continuous tuning range greater than 4 nm and that "it is obvious that the active section and tunable section has a certain length in order to produce the 30 nm or more [continuous tuning range]." Applicant respectfully disagrees with the Examiner's reading of Karioja. On the contrary, Karioja states that the diode laser configuration according to the invention creates only a quasi-continuous tunable wavelength range of at least 4 nm, not a continuous wavelength range, like that produced by Applicant's tunable semiconductor laser. See Karioja at col. 5, lines 7-12. In fact, Fig. 6 of Karioja shows very clearly that the tuning range of the disclosed laser is not continuous and therefore exhibits mode skipping over the tuning range – the exact problem that Applicant's invention solves. Further, Karioja discloses a tunable range of only about 4 nm. See Karioja at col. 5, lines 7-12 ("[i]n the diode laser configuration according to the invention, such movement creates . . . a quasi-continuous tunable wavelength range of at least 4 nm (for instance 980 nm – 984 nm") and at col. 6, lines 20-23 ("[t]he wavelength changes at most 3.7 nm (984.7 nm . . . 981 nm) in this experiment"). There is absolutely no teaching or suggestion whatsoever that the design disclosed in Karioja can produce a tuning range of 30 nm, let alone a continuous tuning range of 30 nm.

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Thus, unlike Applicant's laser, the laser taught in Karioja cannot be used effectively in dense optical communications systems applications.

The tuning lasers disclosed in Uenishi and Gordon exhibit the same deficiencies as described above in conjunction with Karioja. Specifically, these references also do not teach or suggest the structure recited in amended claim 1, and they in no way suggest that the disclosed tuning laser can produce or be altered to produce a continuous tuning range of 30 nm.

In sum, the tunable lasers disclosed in Karioja, Uenishi and Gordon are nothing more than examples of the types of tunable lasers discussed in the background section of the application. See Application, p.1, line 5 – p.3, line 16. As discussed, these lasers do not have a tuning range of 30 nm, they all suffer from mode skipping, thereby limiting their use in dense optical communications system applications. Thus, Applicant's invention solves specific problems not addressed by the teachings of Karioja, Uenishi or Gordon. Applicant therefore contends that his invention is not an obvious extension of these prior art tunable lasers.

In addition, neither Karioja, Uenishi nor Gordon recognizes the total length of an active section and a tunable section of a resonant cavity is a result effective variable. In particular, Karioja does not disclose a gain length L_1 of an active section, let alone discuss the relationship between the total length of a resonant cavity comprising the lengths of an active section and a tunable section and the tuning range of the laser or the continuity of that tuning range. The only dimension discussed in Karioja is the length of internal cavity 205, which not the same as the total length of the resonant cavity recited in amended claim 1. Uenishi merely shows that a center beam may be moved to vary the wavelength of the disclosed laser. Again, Uenishi is completely silent regarding (i) the relationship between the total length of a resonant cavity that includes the lengths of an active section and a tunable section and (ii) the tuning range and the continuity of the tuning range of the disclosed laser. Gordon is similarly silent. The law is clear that the prior art must first recognize a variable as result-effective before the determination of the optimum or workable ranges of that variable can be characterized by routine experimentation. Because the art cited by the Examiner fails to recognize the total length of a resonant cavity comprising a gain length and a tunable length as a result-effective variable, the Examiner cannot properly characterize the range of the total length recited in amended claim 1 as routine

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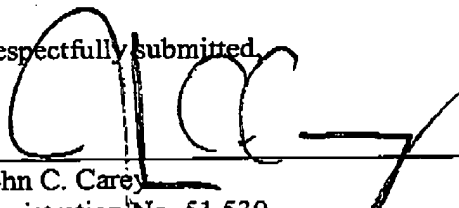
experimentation involving only routine skill in the art. For this reason, Applicant contends that the Examiner's § 103(a) rejection of claim 1 was improper.

Based on the foregoing, Applicant respectfully submits that amended claim 1 is in condition for allowance and requests withdrawal of the § 103(a) rejection of this claim. Since claims 2-18 depend from allowable amended claim 1, Applicant submits that these claims also are in condition for allowance.

CONCLUSION

Having addressed all issues set out in the Office Action mailed on June 3, 2004, Applicants respectfully submit that the pending claims are in condition for allowance and request that these claims be allowed. If the Examiner has any questions, please contact the Applicants' undersigned representative at the number provided below.

Respectfully submitted,



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